PATENTS

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: Tadayuki Tsutsui et al.

Examiner: Michael La Villa

Serial No.: 09/993,562

Art Unit: 1775

Filed: November 27, 2001

Docket: 111223

For: Mechanical Fuse And Method Of Manufacturing The Same

Dated: April 8,2005

Assistant Commissioner for Patents
Washington, DC 20231

DECLARATION OF Tadayuki Tsutsui UNDER 37 C.F.R. §1.132

Sir:

I, Tadayuki Tsutsui, hereby declares and says that:

(1) I am one of named inventors of the above-identified patent application, U.S. application Serial No. 09/993,562;

(2) I have complete knowledge of the subject matter disclosed in U.S. application Serial No. 09/993,562, filed on November 27, 2001 and have reviewed the specification of the present patent application;

(3) There are typographical errors on last line of Table 3 in the specification and I submit corrected Table 3 which has true data and conforms to Table 3 in the basic patent application of the priority;

(4) All statements made herein are true, and that all statements made on information and belief are believed to be true; and further that these statements are made with the knowledge that willful false statements and the like so made may be punishable

by fine or imprisonment or both, under Section 1001 Title 18 of the U.S. code and that such willful false statements may jeopardize the validity of the application or any patent issuing therefrom.

Dated: April 8, 2005

Tadayuki Tsutsui

Tadayuki Tsutsui

Oliff & Berridge, PLC
277 South Washington Street
Suite 500
Alexandria, VA 22314
(703) 836-6400

With attached Table 3

Table 3

C content (mass %)	Tensile strength (MPa)	Fatigue strength (MPa)	Fatigue limit ratio
0.02	120	36	0.30
0.10	208	81	0.39
0.30	316	137	0.43
0.70	431	151	0.35
0.80	457	151	0.33

Test number	Sample number	Mixing ratio (mass%)				Overall composition (mass%)				Steam treatment	Gas soft nitriding treatment	Roundness	Tensile strength (MPa)	Fatigue strength (MPa)	Fatigur limit ratio	Coments
		Iron powder	Additive element kind		Graphite Powder	Zinc stearate powder	Fe	Additive element kind								
(2)	1	Balance	Ni	0.1	0.5	0.75	Balance	Ni	0.1	(0.3)	Mesh belt furnace (570° C X 15 min)	Not treated	(about 0.007 ~0.008)	240	75	0.31	Out of lowere additive element
	2			0.7					0.7					305	120	0.39	
	3			2.0					2.0					379	164	0.43	
	4			5.0					5.0					470	168	0.36	
	5			6.0					6.0					520	168	0.32	Out of upper additive element
(2)	6	Balance	Cu	0.1	0.5	0.75	Balance	Cu	0.1	(0.3)	Mesh belt furnace (570° C X 15 min)	Not treated	(about 0.007 ~0.008)	200	60	0.30	Out of lowere additive element
(2)	7			0.7					0.7					255	90	0.35	
(3)					0.2					0.02				120	36	0.30	Out of lowere C content
(3)					0.3					0.1				208	81	0.39	
(1)					0.5				2.0	0.3	Not treated		0.0033	363	99	0.273	Not steam treatment
(1)											Mesh belt furnace (570° C X 5 min)		0.0040	334	121	0.362	
(1), (2)8, (3), (4)											Mesh belt furnace (570° C X 15 min)		0.0077	316	137	0.434	
(4)												Treated	(0.0077)	302	159	0.53	Preferable example
(1)											Pot furnace (570° C X 180 min)	Not treated	0.0125	305	149	0.489	
(3)					1.0					0.7	Mesh belt furnace (570° C X 15 min)		(about 0.007 ~0.008)	431	151	0.35	
(3)					1.1					0.8				457	151	0.33	Out of upper C content
(2)	9			5.0	0.5				5.0	(0.3)				400	140	0.35	
(2)	10			6.0					6.0					440	141	0.32	Out of upper additive element
(2)	11	Balance	Mo	0.1	0.5	0.75	Balance	Mo	0.1	(0.3)	Mesh belt furnace (570° C X 15 min)	Not treated	(about 0.007 ~0.008)	160	50	0.31	Out of lowere additive element
	12			0.7					0.7					207	83	0.40	
	13			2.0					2.0					253	110	0.43	
	14			5.0					5.0					321	112	0.35	
	15			6.0					6.0					359	113	0.31	Out of upper additive element
(2)	16	Balance	Cr	0.1	0.5	0.75	Balance	Cr	0.1	(0.3)	Mesh belt furnace (570° C X 15 min)	Not treated	(about 0.007 ~0.008)	150	45	0.30	Out of lowere additive element
	17			0.7					0.7					192	77	0.40	
	18			2.0					2.0					237	103	0.43	
	19			5.0					5.0					300	105	0.35	
	20			6.0					6.0					330	106	0.32	Out of upper additive element
(2)	21	Balance	Mn	0.1	0.5	0.75	Balance	Mn	0.1	(0.3)	Mesh belt furnace (570° C X 15 min)	Not treated	(about 0.007 ~0.008)	140	38	0.27	Out of lowere additive element
	22			0.7					0.7					185	65	0.35	
	23			2.0					2.0					221	96	0.43	
	24			5.0					5.0					284	98	0.35	
	25			6.0					6.0					308	99	0.32	Out of upper additive element

Gray areas are out of condition for the application
C content of test (4) is a presumed value from tests (1) to (3)
Roundness of tests (2) to (4) is a presumed value from test (1)

量と、疲れ強さとの関係も、引張り強さと同様な関係を示している。

【００３７】

疲れ限度比は、添加元素がない場合には０．３を下回ることが予測される。添加元素の含有量が増加するに伴って疲れ限度比は高くなり、含有量が２～３．５％で最大の０．４３となり、それ以上の含有量では低下する。疲れ限度比が向上して０．３５以上が確保される添加元素の含有量は、０．７～５％である。

【００３８】

（３）Ｃ含有量と疲れ限度比について

鉄粉への２．０％の銅粉および０．７５％のステアリン酸亜鉛粉の添加量を一定とし、かつ、黒鉛粉の添加量を０．２％、０．３％、０．５％、１％、１．１％とした３種類の混合粉を調整した。これら混合粉から、上記（２）の場合と同様に、圧粉体の成形、焼結、試験片作成、スチーム処理を行い、それぞれの試験片を得た。これらのＣの含有量は、それぞれ０．０２％、０．１０％、０．３０％、０．７０％、０．８０％であった。０．０２％のＣを含有するものに関しては金属組織では判別が困難であったため、化学分析によった。その他は金属組織を基に調べたＣの含有量である。各試験片を用いて、引張り強さ、回転曲げ疲れ強さおよび疲れ限度比を求めた。それらの結果を、表３に示す。

【００３９】

【表３】

Ｃ量（質量％）	引張り強さ（MPa）	疲れ強さ（MPa）	疲れ限度比
0.02	120	36	0.30
0.10	208	81	0.39
0.30	316	137	0.43
0.70	431	151	0.35
0.80	457	151	0.33

【００４０】

表３によると、Ｃの含有量が０．１０～０．７０％の範囲で疲れ限度比は０．３５以上であり、Ｃの含有量が０．３～０．５％で最大の０．４３を示す。比較